

Sub-optimal Seed Rate: an Important Reason of Low Sugarcane Yield in Pakistan

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ABSTRACT: *Low seed rate is considered as one of the most important factors responsible for the decreased sugarcane yield in Pakistan. Low level of farmers' knowledge is considered to be the main reason. However, the empirical evidences in this regard are very rare. The purpose of this study was to assess and give empirical evidences of farmers' knowledge and their trend of seed rate usage in sugarcane cultivation. Fifty six percent respondent farmers did not know the recommended seed rate instead they knew it in terms of area specified for seed production (Merla). None of the farmers weighed seed before sowing. The actual average seed rate was significantly ($p=0.05$) less (28%) than recommended (100 Maunds/acre). This is an important reason of low sugarcane yield in Pakistan. Therefore, there is a dire need of giving more emphasis on optimal seed rates in our existing extension systems.*

Keyword: Seed rate, Sugarcane, Yield, Farmers Knowledge.

I. INTRODUCTION

Sugarcane is cultivated on an area of 1.1 million hectares in Pakistan with a total production of 54.7 million ton. It contributes 0.8% to GDP and 3.6% to value added in agriculture (GOP, 2010). Average yield of Sugarcane is 54.8 tons against the world average of 70.54 tons per hectare (FAO, 2012). Regardless of pronounced developments in sugarcane research and expansion in sugar industry, farmers often obtain 10-20% less yield (ca. 55 tons/hectare) than researchers (100-150 tons/hectare) (Javed, 1996; Akhtar et al., 2003; Yaseen et al., 2005), although both use the same technology. This is might be due to management differences.

Several factors predict cane yield at farmers' field i.e. low yielding varieties, high weed infestation, improper time of

planting, water availability, insect pests damage to the crop and imbalanced plant nutrition (Akhtar and Akhtar, 2002; Arain et al., 2011). Improper row spacing, seeding density and farmers' knowledge have also been regarded as the most critical factors predicting sugarcane yield in Pakistan (Alvarez and Rohrmann, 1985; Bashir et al., 2000; Mahmood et al., 2005).

Although cane cultivation needs site specific agronomic practices, the general recommendations (according to the Agriculture Department of Punjab, Pakistan) of optimum seed rate include 80-100 maunds/acre for thin varieties or 60,000 buds/acre. Several authors (Muhammad et al., 2001; Majid, 2001; Naeem et al., 2007) have reported low seed rate as one of the most important factor responsible for the decreased yield of

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sugarcane in Pakistan without any empirical evidences.

The purpose of current study was to assess and give empirical evidences of farmers' knowledge and their trend of seed rate usage in sugarcane cultivation in Punjab.

II. MATERIALS AND METHODS

The study was conducted in five different villages of district Jhang, Pakistan during October to November, 2013 i.e. villages along Faisalabad, Toba Tek Singh and Gojra roads, within the radius of 10 km from the main city.

A total of 25 small land holders (having <10 acres), five in each village, were selected for the study. Besides age and education, the knowledge of seed rate was also recorded. At the time of sugarcane sowing, seed weight with and without trash was measured through computerized electronic balance. For which weight of empty trolley was subtracted from the weight of loaded trolley. Net weight of seed was obtained by subtracting seed weight without trash from the seed weight with trash. As this study was conducted at farmers field by considering the general recommendations for farmers (i.e. 100 Maunds per acre for thin varieties), we did not count number of buds. Farmers' perception about the expected weight of seed (weight of loaded trolley to be sown) was also noted.

Paired sample t-test ($\alpha=0.05$) was applied to compare the (i) weight of seed before and after removal of trash, (ii) farmers expected and actual seed rate and (iii) actual seed rate and recommended seed rate. Frequency distribution test was applied on number of farmers with actual seed rate they applied. Percentages were used wherever necessary.

III. RESULTS

Eighty percent respondent farmers were young (25 to 40 years of age) and 92% were literate (having primary to intermediate level of education). Fifty six percent respondent farmers told seed rate in terms of area specified for seed production i.e. 32% told 12 marla and 24% told >12 to 14 marla for sowing one acre. Forty three percent farmers told seed rates in terms of the weight i.e. 8%, 20% and 16% farmers told 50 to 60, 100 and >100 to 120 maunds per acre, respectively. None of the farmers weigh seed before sowing (Fig 1).

After removal of trash, the net weight (71.79 maunds/acre) was significantly (t -observed=16.6, t -critical=2.06, $p<0.0001$) less (19.74%) than the seed with trash (89.56 maunds/acre). The average expected seed rate (78.32 maunds/acre) by the farmers was non-significantly (t -observed=1.04, t -critical=2.06, $p=0.307$) less than average actual seed rate (71.79 maunds/acre). However, this actual seed rate was significantly (t -observed=10.07, t -critical=2.06, $p<0.0001$) less (28.21%) than recommended (100 maunds/acre) (Fig 2).

Only 4 (16%) farmers used recommended seed rate i.e. 100 to 120 maunds/acre, 12 farmers (48%) used 80 to 98 maunds/acre while 9 (36%) farmers used 67 to 79 maunds/acre (Fig 3).

IV. DISCUSSION

The actual seed rate in this study was significantly less (28.21%) than recommended seed rate. The sub-optimal seeding density results in poor plant population density and hence less number of cane stalks per unit area which is the key component of cane yields (Domini and Plana, 1989; Nazir et al., 1999; Bashir et al., 2000; Mahmood et al., 2005).

Fifty six percent farmers could not tell about the recommended weight of sugarcane seed, instead they reported seed rate in terms of area (Merla). Such findings have already been reported from nearby district Faisalabad (Muhammad et al., 2001) where more than 60% of the respondents were unaware of recommended seed weight and adopted traditional area-measurement units (merla). Lack or low level of awareness has been a major constraint towards adoption of recommended practices in sugarcane cultivation (Muhammad et al., 2001). Besides formal school or college level education there is a need to train farmers through capacity building programs and disseminate better management practices through different sources i.e. relatives, friends, neighbours, radio, television, extension agencies and printed materials (Ali et al., 1992; Fasih, 2008).

Agricultural extension is an essential pillar for agricultural development however; this sector did not flourish in Pakistan due to financial and technical constraints (Qamar, 2005). The private sector including agro based business industries and a number of NGOs have taken over this social responsibility and entered into the extension work and 70-80% of the extension services are being provided by private sector through their own independent set-ups (Riaz, 2010). Farmer Field School (FFS) is an effective approach towards adoption of better management practices as farmers reported to have increased their sugarcane yield by 930 kg/acre by using more seed 3500 kg/acre after FFS i.e. 2570 kg/acre before FFS (Habib et al., 2007).

In conclusion, farmers are using less 28% less seed than recommended due to lack of awareness and training. This is an important

reason of low sugarcane yield in Pakistan. Therefore, there is a dire need of giving more emphasis on optimal seed rates in our existing extension systems.

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VI. Figures

Fig 1. Sugarcane seed rate usage trends among farmers of district Jhang, Pakistan

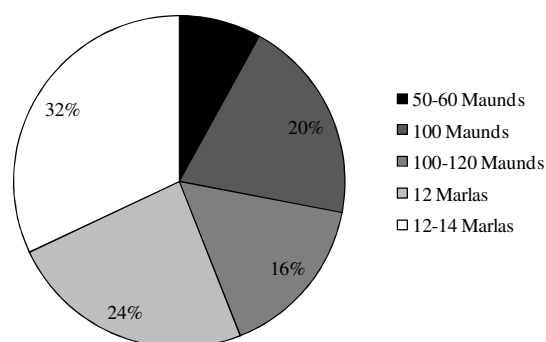


Fig 2. Comparison of farmers expected and actual seed weight with recommended seed rate by department of Agriculture Extension, Punjab at district Jhang, Pakistan

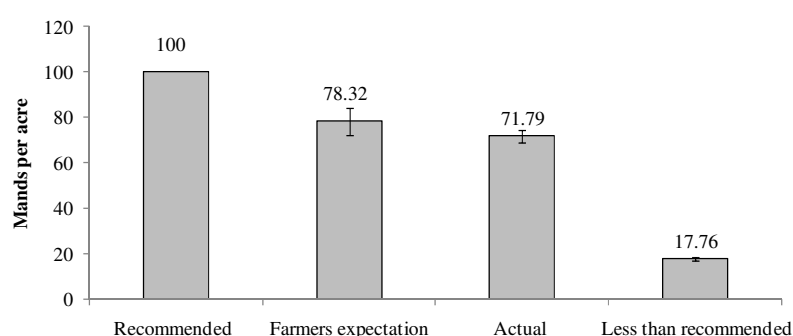
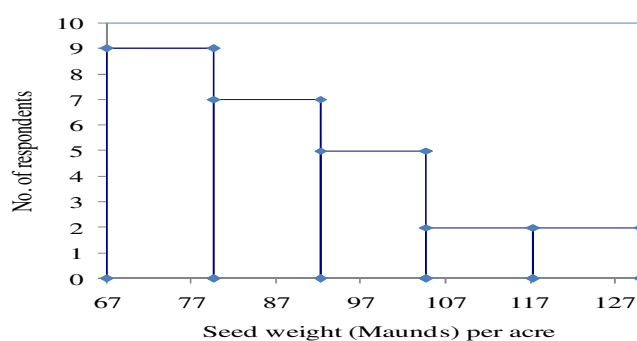


Fig 3. Frequency distribution of number of farmers based on sugarcane seed rates they applied at district Jhang, Pakistan



Novelty statement: Sub-optimal seed rate is considered as one of the main reason of low sugarcane yield in Pakistan. However, empirical evidences in this regard are insufficient. Current study gives its quantitative assessment in sugarcane growing district Jhang of Punjab, Pakistan.